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ABSTRACT

After examining the impact of changing technology on postsecondary instruction and on the tools needed for instruction, this report analyzes the status and offers recommendations concerning the future of instructional computing at Vancouver Community College (VCC) in British Columbia. Section I focuses on the use of computers in community college instruction, looking at changes in occupational instruction, the background of these changes, the impact and use of computers in colleges, and the instructional use of computers. The current status of instructional computing at VCC is addressed in section II, while section III offers observations concerning the provision of computer-related training, computer applications training, computer literacy training, computer-assisted learning, and courses on the computer as a tool. Finally, a series of recommendations are presented for the further introduction of instructional computing at VCC, covering areas such as instructional objectives and computing; curriculum development and delivery; planning for instructional computing development; accessibility, security and communications; organization in support of instructional computing; and equipping, maintaining and financing instructional computing. Inventories of computing requirements and an instructional computing survey instrument are appended. (LAL)

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PREPARING FOR FURTHER INTRODUCTION OF COMPUTING TECHNOLOGY IN VANCOUVER COMMUNITY COLLEGE INSTRUCTION

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REPORT OF THE
INSTRUCTIONAL COMPUTING COMMITTEE
NOVEMBER 1984

PREPARING FOR FURTHER INTRODUCTION OF COMPUTING TECHNOLOGY IN VANCOUVER COMMUNITY COLLEGE INSTRUCTION

Report of the Instructional Computing Committee

November, 1984

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ABSTRACT

Changes in technology, especially the growing and spreading use of computers, are affecting the occupations of the Vancouver area workforce; the delivery of instruction and, perhaps, the way students learn. This report examines the impact of changing technology on post-secondary instruction and the tools needed for instruction. The changes in occupation instruction and the equipment required are reviewed. The status and future of instructional computing at V.C.C. is analyzed and recommendations concerning the further introduction of computing into instruction and its support are made.

RECOMMENDATIONS

- Regular assessments to identify new competencies related to occupational areas within V.C.C.'s instructional mandate should be conducted by the College.

- Major regional employers should be brought together by the College regularly to assist in identifying occupational areas undergoing rapid change for which training curricula must be revised or for which new programs may be developed.

- The College should actively pursue some highly visible collaborative arrangements for state-of-the-art training with companies in order to encourage other firms in the Vancouver area to such mutually beneficial collaboration.

- VCC should take a leadership role in developing formal relationships with colleges and institutes in the Lower Mainland with the objective of planning the establishment of curriculum areas of concentration for advanced technology training and of sharing the development resources where overlapping programs are necessary utilizing microtechnology.

- Based on information about changing occupational training and educational methodology, plans by the college should be further developed to assure instructor currency.

- The College should develop a general statement of instructional objectives in relation to computing as a guideline for program objectives and resource allocation.

- Resources must be gathered and deployed by the College through a variety of mechanisms such as: industry, financial support; Skills Growth Funding, productivity gains; and etc. to support the continuing need for curriculum revision and development as a result of the impact of microtechnology.

- The College should continue to actively pursue computer-based alternative and non-conventional instructional delivery systems both for the productivity opportunities they may present and for the opportunity to provide enhanced learning experience for the students.

- A standing committee for computer planning and utilization should be established with administrative and instructional representation from all centres of VCC to address and advise on instructional computing needs and development.

- The instructional centres of the College should develop plans for introduction and development of instructional computing in the context of overall College instructional computing objectives. Such plans should be five year based.

- Instructional centre plans should address the priority of deployment of equipment for instructor use during periods of curriculum work or program development.

- In recognition of the need for both instructional class and independent study access to computing resources by students, the College will continue to provide various computing resources for student use in central facilities and to maximize access.

- The College should capitalize on the existing elements of local area network at each campus to support more flexible classroom access to computing by completing the system and also provide a small pool of mobile microcomputers for classroom use.

- External computing access must be provided where appropriate and within specific limits to support computer related instruction in VCC programs.

- The cost effectiveness of alternatives to telephone links for data transfer between the College's campus should be reviewed regularly to ascertain whether capital expenditures could result in significant long term savings.

- That a high priority be placed on the design of a "computer lab assistant" classification and the hiring of such individuals to increase the efficiency of the utilization of such facilities at all three College instructional centres.

- An instructional computing support service should be established to provide College coordination and delivery of instructional computing services. The service should be directed as College-wide support service.

- The reporting relationships of the Computer Services Department should be examined in the light of developing instructional computing services activity.

- Through development of in-house capabilities and/or contract services, computing resources maintenance needs should be improved to meet instructional computing requirements.

- Identification of funds to support the updating of VCC programs in the next few years should be a high priority directed to equipping instructional programs to meet the impact of computing.

Preparing for Further Introduction of Computing Technology
in Vancouver Community College Instruction

1. COMPUTERS IN COMMUNITY COLLEGE INSTRUCTION

1.1. Background of Change

Current advances in technology are having a dramatic impact on colleges. The post-secondary educational system faces the prospect of a massive change in a system that in British Columbia, is less than 25 years old. Before assessing this situation and its impact on Vancouver Community College, it is useful to review what led to the current state.

All the changes that have occurred in the history of education seem to pale before the invention and introduction of writing. It can be argued that printing and computing are simply technological improvements on that basic idea. However, we are not living through the introduction of writing or of printing. We are experiencing the introduction of computing. That fact alone makes the 'electronic revolution' different for us.

There is another difference, at least as viewed from the present. The inauguration of writing and printing seem, from this distance and in the light of the changes we are experiencing, to have been slow, evolutionary changes. They took centuries. This latest technological change is taking place in our generation. The electronic computer is less than 40 years old. The microcomputer has been with us about 15 years and only readily accessible for seven.

We are in the midst, then, of an electronic revolution. It is a revolution that is interjecting the computer into an ever growing variety of activities touching communication, the workplace, instruction and leisure.

1.2. Impact of Computers on Colleges

First, and most importantly for colleges, computers are having a radical impact on the workforce. It has been variously estimated that in the next several years between 50 and 70 percent of all jobs will have some form of computing integrated into them. Thus, there is growing interest and pressure from employers to ensure that education and training prepare students and existing employees to deal with the use of computer-related technology in the workplace. Second, is the reaction of students to computers. Whether, they are recently graduated from high school, recently dropped out of school or whether they are mature adults, significant numbers seem tremendously excited by and interested in computers. No other educational machine or concept has generated as much publicity as computers have generated because of their seeming ability to motivate and captivate students.

Finally, many of those persons promoting computers and those educators using computers see a potential to influence immeasurably the educational system and the way students learn. A flood of computer assisted learning software in recent years attests to this belief. The first computer based "university" began operation as a private institution in San Francisco recently and, according to reports, has 8,000 students taking 200 courses - credit and non-credit.

Various attempts have been made to categorize and describe the changes that are taking place. Yoneji Masuda, the former executive director of the Japan Computer Usage Development Institute and Chief Researcher of the Japan

Productivity Centre has pointed to automation as the replacement of man's mental labour and termed this era as the information epoch (Masuda, 1981). He notes that in the industrial society the steam engine and its successors served to amplify the physical labour of man. In Masuda's "information society" the computer serves to amplify the mental labour of man.

Much of business and industry and more recently government and education has accepted the inevitability of this change and is now calling for colleges to make use of and instruct in computer technology and its applications. The colleges have responded and in a few short years, the single main frame computer has been supplemented with minicomputers, microcomputers and specialized microelectronic equipment dedicated to instruction.

1.3. Use of Computers in Colleges

Because of the immediacy of the changes occurring incomplete information is available about the characteristic uses of computing in instruction in the two and microcomputers in small two-year colleges (Bender, 1983) does give a partial picture. In colleges with a student population of 3000 or less 91 percent reported owing at least one microcomputer; 88 percent reported some type of word processing capacity. The microcomputers are predominantly used as independent units (96 percent) though 20 percent of the respondents reported their units are also part of a local area network. Instructional laboratory officers were identified as having the authority for distribution (59 percent) with the campus pattern for location of microcomputers being primarily in centralized labs for instruction (75 percent) and lab hours being the basis of control for microcomputer access in 58 percent of the cases. The preponderant use of micro-computers in instruction is reflected in the locus of responsibility---they are identified with academic departments in 52 percent of the cases in contrast to the computer centre where only 12 percent of the respondents indicated this as the primary location of microcomputers.

When examining future plans, the study found that 81 percent of the institutions projected acquisition of additional microcomputers over the next three years. Approximately 25 units per institution were projected for purchase.

A very recent series of studies entitled New Technologies in Canadian Education includes a paper on communication and information technologies in community colleges in Canada (Budden, 1984). While the paper does explore the older information technologies of film, television and radio a major portion explores computer technology.

It notes that the rapid developments in the applications of computer technology have virtually all Canadian community colleges and technical institutes "scrambling to respond to new developments reactively rather than proactively."

The role of the federal Skills Growth Fund (SGF) is briefly explored. The infusion of almost $200 million into colleges to support the purchase of new equipment for training facilities in designated skills shortage areas has led to the acquisition of computer-assisted design and computer-assisted manufacturing training facilities at a number of colleges across Canada.

The SGF money ($2.8 million) is supporting seven Ontario colleges in the development of a comprehensive array of instructional software in occupations deemed to be of national importance. In the cooperating colleges computer-assisted instruction (CAI) and computer-managed learning (CML) programs will be developed to operate on a minicomputer system. Instructional software will integrate, according to plans, interactive video into computer-based instruction.

Computer-based or-managed software will be developed for such programs as robotics technician; chemical process unit operator; systems analyst; electronics engineering technician; welder-fitter; industrial maintenance mechanic; industrial engineering technician; mechanical engineering technician and industrial electrician.

The report explores further the problems of software development and notes that what does exist often lacks educational quality. To attempt to overcome that, some Canadian colleges have allocated resources to projects of instructional software development. Those that support such in-house production usually ensure that computer-based authoring systems are available. The Ontario colleges, for example, are using a common language and operating system called CAN-8. Algonquin College has developed a program to teach the CAN-8 authoring language to prospective courseware developers. A few colleges use a team approach in software production. A content specialist, a specialist in instructional design, strategies and production and a programming specialist are combined at Ontario's Sheridan College to work on instructional software development. A number of colleges have taken the position that only professionals in the software production business should be producing programs and are not supporting in-house development.

Throughout Canada, major instructor training initiatives are underway to enable faculty and, often, support staff to develop skills in high technology. Computing facilities dedicated to instructor development are common. Newly hired instructors have available, in mandatory instructor training programs, courses introducing computers and education in several colleges.

The report concludes that colleges are faced with the need to reallocate priorities to support the further acquisition of computing resources; need to reorganize space in order to house new equipment; need to reorganize class scheduling to ensure optimum use of computer facilities; need to retrain or employ support staff to further optimize use of computer facilities; and need to encourage ongoing instructor training so that computer applications in business and industry are understood and integrated into curricula.

Little is said in this report or Bender's study about the specific instructional uses that computers are being put to in colleges. Five major categories can be identified for the instructional use of computers:

1. Computer related training - this category includes training for computer operators, programmers, systems analysts, computer electronics technicians and other occupations based in data processing and the computing industry.

2. Computer applications training - a rapidly expanding list of workplace applications includes accounting, banking and finance, energy conservation and management, engineering and science, drafting and graphics design, communication, law enforcement, journalism, writing, medicine and health care, pharmacy, purchasing, manufacturing and production, real estate, sales, warehousing and distribution, transportation ...

3. Computer literacy - in general, the term is used to indicate introductory instruction in the use of computers. The term may be taken to mean whatever understanding skills and attitudes one needs to function effectively within a given role that directly or indirectly

involves computers. Unfortunately such a definition can include all instruction related to computing.

4. Computer-assisted instruction or learning (CAI or CAL) - has included, most commonly, such automated activites as drill and practice, tutoring, demonstration, simulation and instructional games.

5. The computer as a tool for student use - the computer is utlized as an instrument for analysis of statistics, writing and graphic presentation and thus enhances the work of the student.

1.4. Computer Related Training

Two year colleges have been involved in the training for computer careers for several decades. Programmers, operators, analysts, computer maintenance personnel, data entry operators and computer sales personnel, have been in high demand as the use of computers in business and industry spread. The rapidity of change in data processing related fields continues to demand retraining and upgrade training but local economic recession has seen some slowing of demand for employment entry level skills. For example, in B.C. in the period 1981/82 to 1983/84 the unemployment rate of data entry operators tripled. Forward projections by Canada Employment and Immigration Commission (C.E.I.C.) suggest a slowing of demand for newly trained programmers and computer operators.

Nevertheless, well-trained computer operators, programmers, technicians and systems analysts should have a range of opportunities to choose from. In the period to 1990 computer programmer jobs are expected to increase 77 percent; office machine servicers 86 percent; computer operators 91.7%; and systems analysts 112% according to the U.S. Bureau of Labor statistics. While such U.S. based predictions may not be totally valid for the Vancouver area, other studies suggest continued interest on the part of local businessmen in further automation.

A study prepared for the Vancouver Economic Advisory Commission on the skill requirements in the 1980s indicated that among the emerging skills that are to become more important are those of the systems analyst and designer because of growing automation (Knauf, 1984).

1.5. The Computer Applications Training

The increasing need for computer applications training is somewhat easier to identify if not to quantify. The study cited above had more training and applied computing.

> "Computing will become increasingly important in the [Vancouver] industries surveyed. On the production floor, automated machinery will require machine operators, maintenance personnel and technicians who have the necessary skills to operate and maintain the equipment. The office, which has seen relatively few productivity changes compared to other departments in the last decades, will probably be the most subject to change. The vast majority

> of those surveyed indicated that word and data processing skills along with the ability to understand electronic filing are becoming part of the basic repertoire of clerical staff....About one third of [study] participants anticipate some problems in filling vacancies in the following two categories in the next five years. The first category includes occupations such as systems analysts, specialized programmers, computer numerically controlled machine (CNC) operators, and computer aided design and manufacturing (CAD/CAM) skills....Also, health care and related fields expect shortages...."

Discussions with industry and business both in Canada and the United States indicate that computers are at the centre of a revolution in manufacturing, communications and service occupations. The valid assumption is that a high percentage of jobs will be computer related. True as this may be, it is a misleading idea. As has been pointed out, these jobs include everything from a cashier using a bar code scanner to a video clerk selling video game cartridges. (Menosky, 1984) Although U.S. estimates have indicated some 30 million jobs will be computer related, the great majority will require no formal training about computers. The actual number of jobs requiring specific "high tech" training will be small.

There is concern, in fact, that the impact of computers will be to polarize skills and create a significant number of deskilled occupations. Heather Menzies in her study of women and the computer suggested in a series of case studies that clerical productivity was being increased through reduced labour content of clerical functions; fewer clerical functions for types of service provided; amalgamation of distinct clerical jobs; reduction of supervisory requirements and through efficiencies in transmitting information. She related these changes to introduction of automation. Thus, working in an office or an assembly line may no longer require specialized skills, only the ability to monitor a machine and press a button.

Some additional cautions are in order. Some futurists insist that the impact of computers may be much more complex than is generally realized. Certainly it is much too simplistic to suggest that the answer to a job in the future is to know now to operate or program a computer. The need for those competencies may be significantly less than anticipated by some. The capacity to program would seem to be of use to a limited number of students in the future. However, programming in simple languages is an excellent introduction to computer systems and utilization.

Another factor may also limit the need to know how to program a computer. Each new generation of computers and of software, especially since computer manufacturers have discovered the consumer market, requires less knowledge about computers than before. This is readily evident to anyone who has had a chance to use an Apple Lisa or a Macintosh microcomputer. The average business microcomputer user is more concerned with knowing how to apply the software acquired than with knowing how to program.

For community colleges, developing the capacity to train in computer applications may be the greatest challenge. Already thousands of software packages are available for microcomputer applications. The Databook Directory of Microcomputer Software lists over 200 packages useable on the IBM Personal Computer for accounting activities alone. Another 250 accounting programs are available for CP/M operating system micro-computers. Engineering and scientific applications, manufacturing, sales and distribution and so forth, each has available dozens or hundreds of software programs.

Two factors help to overcome the problem of the unassessed proliferation of software for the educational institution, however. First, the market place creates favorite programs. Wordstar, for example is clearly the most common word processing program for microcomputers, at present. Training based in Wordstar would support the majority of users. Second, training in a specific software package tends to allow a user to generalize to other similar packages. Thus, learning to use one spreadsheet gives the user the ability to learn to use other spreadsheet programs. Finally, software developers are now developing computer-based tutorial packages designed as self-instruction courses in common applications areas such as word processing and simple data base management.

1.6. Computer Literacy

Computer literacy is a different challenge for the two year college. Only 20 years ago the primary location for training in computers was in the graduate schools of large universities. Elementary school children are now being introduced to computer operation. Thus, the age level for acquiring computer literacy has dropped rapidly.

The objectives of school based literacy programs seem to be two-fold. First, the instruction is aimed at providing students with the competencies necessary to deal with the impact of computers on their lives. Second, in addition to preparing students for adult life, schools are using computer literacy training to give students skills that are important for use in acquiring further education.

This massive relocation of the age level at which students are given basic computing skills has implications for the community colleges. Since, an increasing number of students will enter the post-secondary stream with computing skills and an expectation that computing support for learning will be available, the colleges will find it less necessary to concentrate its computer literacy training on high school direct entry students.

Nevertheless, post-secondary institutions will have a continuing role to play in the provision of computer literacy. The primary reason is that the colleges have a clientele which covers a wide age-range. One result of the broad age span is that the two year post-secondary institutions will be serving clients who have not received computer literacy instruction from the secondary obvious that if the school system is able to provide appropriate levels of computer literacy from now on, the need for computer literacy at the tertiary level will decline steadily.

The wide age range of the college student population has a second consequence. Many students returning to college in the future who may have had introductory courses in computers at the secondary level will find that time has made much of their understanding and skill obsolete. So the colleges will be in the computer literacy business for the foreseeable future.

1.7. Computer Assisted Learning

There is still disagreement over the effectiveness of the computer as a tool for instruction. The advocates cite studies which show, at least, equal learning efficiency and retention when computer-based learning is compared with other more traditional learning methods. The critics of computer-assisted learning cite the hundreds of badly conceived and ineptly produced software packages available and condemn the entire approach.

First, a few definitions: Computer-assisted instruction (CAI) has been used to mean the presentation of instructional material and questions on that material through a computer. The student responds to the computer as questions are posed. Computer-assisted learning (CAL) is often used to describe similar through computers (CAI) and teaching with computers as noted in the computer literacy section above. Both terms are used interchangeably however.

Three modes of CAI or CAL are being developed: drill and practice, tutorial and simulations. The initial two hold promise for remedial instruction while the simulation approach is moving toward vocational skill development. All are limited, however. They cannot support training which requires motor skill development in specific applications nor training which requires interpersonal interaction.

Computer-managed instruction (CMI) is still a third term which has appeared in the last few years. Again, useage is imprecise but, in general, the phrase is used to describe systems which use the computer to maintain records for the student, monitor achievement and, possibly, deliver or prescribe follow-up activities. The term does not necessarily mean that instruction will involve computers and may relate primarily to instructional administrative activities.

Ronald Ragsdale sums up the progress made over the last fifteen years in CAL (Ragsdale, 1982). He concludes that some of the promise of CAL, as prophesized in the 1960s; has not been fulfilled but that it cannot be totally classified as a failure. Although too often programs have not been well designed, there have been some instructional software development programs which had sufficient resources and clarity design. Cited is the work done on PLATO at the University of Illinois since 1961 and marketed by Control Data Corporation. PLATO has elegant graphics and an authoring language which assists instructors to construct good quality teaching materials for the system.
individual student's performance and route the individual according to the achieved level of work. Even here there are problems. More than 7000 hours of educational materials have been developed for the PLATO system. Inevitably, the materials produced for PLATO, as with any widely available CAL system, have varied in quality, particularly in the early years, and some have estimated that as many as 5000 hours of this material may be of little value (Ragsdale, 1982).

Ontario colleges, in cooperation with the Ontario Institute for Studies in Education (OISE), have produced a series of computer based semester length courses. Most of the work was done in the 1970s with emphasis on prerequisite mathematics skills. Based in the CAN system (where CAN stands for Completely Arbitary Name) which is curriculum centered and supports innovative systems programming, this Ontario college CAL system has been supported by a computer network which allows a user at any terminal to access any computer in the network supporting the CAN software.

For all of these successes, the major problem facing the proponents of CAL has been the shortage of well developed software. The Databook Directory of Microcomputers Software lists some 450 microcomputer based assisted instruction programs. Distributors range from the games publishers (Milton Bradley) through long time educational materials publishers (Encyclopedia Britannica Educational Corporation and Scholastic Magazine) to such newcomers as Instant Software, Inc. and Edutek Corporation. Recently, there has been a flood of educational software coming on to the market. Much of it is aimed at the elementary and secondary level. The smaller college market is less appealing

to computer software publishers just as it was less appealing initially to educational film producers and video producers...until it was discovered that the college market could be served to some extent with learning materials originally produced for a general adult audience. In the meantime, some of the best of the computer-based learning materials prepared for the secondary schools are going to be useful to community colleges for adult basic education and for pre-college courses for adults.

Identifying the best of the computer-assisted learning materials is the major task that faces all educators as instructional computing moves out of the pioneering phase into widespread involvement with the private sector. Instructors thinking about making use of a newly published book will usually be able to find reviews of it in the subject journals or to receive a review copy for assessment. The same structures have not yet developed to assess CAL materials. Getting review copies of programs is difficult; finding published assessments that are reliable is also difficult. There are some support systems developing, however. In the UK instructional software assessments are being produced by the Microelectronics Education Programme and others. MicroSIFT, established with sponsorship from the National Institute of Education within the Northwest Regional Educational Laboratory in Portland, Oregon is standardizing educational software evaluations and publishing them. Locally, the Provincial Educational Media Centre (PEMC) has begun to assess and publish evaluations of CAL materials. It is interesting to note that, of some 178 software assessments done by teachers under the guidance of PEMC since July 1983, almost 48 percent were either recommended only if changes were made in the program or its support material, or not recommended.

In the Spring of 1984, TeleLearning, a San Francisco based educational telecommunications network began serving college and university students. This fall, 8000 students were registered in 200 courses supported by this private enterprise endeavour. When it began offering computer communication and course ware services last spring four institutions - American Open University of the New York Institute of Technology, De Anza College, Thomas A. Edison State College and Ohio University gave college credit for courses taken through the TeleLearning system. The initial courses were all developed by TeleLearning according to College-Level Examination Program (CLEP) guidelines.

Other institutions are beginning to develop pilot courses for use on the system. The University of Nebraska has an American History course under development. San Diego State University and the University of Wisconsin are investigating the system for use with videotex projects.

This first major private and public cooperative venture in post-secondary level computer-based distance education may foreshadow things to come. On the other hand, extensive use of computer-assisted learning materials may require such large scale developmental funding that its use will be limited to particular situations (wide spread, well defined and stable curriculum areas; high instructor cost areas; highly motivated student groups) in the near term.

1.8. The Computer as Tool

The use of the computer in the colleges as an adjunct tool in instruction is the most difficult to predict in terms of specific uses. The growth of this area of use will depend upon the numbers of students who achieve literacy

levels of computer competency; the number of students who have access to computing resources as a result of personal ownership or institution-based lab access; and the numbers of instructors who achieve greater levels of computer literacy. Already the post-secondary mathematics student enrolled in statistics is expected to learn from and utilize computer-based statistical analysis software. A student studying history may be able to attain a more complete understanding of historical events by application of statistical analysis to historical population data or write more clearly by using a spelling checking program.

Conclusions

We are in the midst of large scale social and economic change based on exploring new ways of storing, sharing and manipulating information through computers and related devices. A major question for community colleges is what, if any, program changes must occur in response to that social and economic development. In addition, colleges must define their role as community leaders in support of this change and define their role as respondents to change in progress.

Experience with other instructional technologies tells us that these latest new technologies should not be viewed in isolation from the other resources being employed for instruction in colleges. There is always danger in over reliance on a single delivery medium.

It is important that college educators not forget the importance of real, direct experience. Both research and experience have shown that learning is enhanced when the student is directly involved with the actual. Simulations on the computer can create models of the real world and make them available for student manipulation but this is not a substitute for real time, real world objects.

Computers unquestionably have a role to play in the provision of instruction but they cannot do the entire job. Uses for the computer in instruction should be identified both in terms of occupational needs and those of lifelong learning. We are seeing computing becoming more and more central in industrial production and processes and in office communication, information processing and storage. Most occupations are being touched by computers; many are undergoing major occupational change. Students must be provided with training that prepares them for the changing occupational demand. At the same time computer software is beginning to appear which will support continuous learning and occupational skills upgrading. Students must be provided with computing and other skills that will support their heuristic endeavours.

2. VANCOUVER COMMUNITY COLLEGE AND COMPUTERS

Like most colleges in North America, Vancouver Community College has acquired computing capacity in direct response to administrative and instructional needs and as funding would allow. Also like many other post-secondary institutions, VCC has had the advantage of having a computing service department responsible for organizing, directing and operating computer support. This department, created to develop and provide for administrative computing in cooperation with the Vancouver School Board, concerned itself

initially with such automated processes as payroll and accounting. However, from its inception its mandate included providing computing service to such programs as data processing and computer programming.

Through the 1970s, the College broadened the range of data processing and computer-related course offerings. During this same period many individual courses changed and expanded to include computer applications in portions of their curriculum. Statistics, mathematics, accounting, business and office training, pharmacy assistant and realty appraisal courses, among others, utlize computing support regularly in instruction. 125 terminals at various locations at Langara Campus and VVI were in use in support of instructional computing by July of this year (See appendix E). In the 1980s the microcomputer has provided a growing alternative and supplement to use of the College minicomputers. Initial acquisition in ones and twos has been based on specific instructional needs and the availability of satisfactory inexpensive software. Thus, a single microcomputer with appropriate statistical programs was added to the equipment in the psychology laboratory to support instruction and to allow instructor development of some unique analytical software. More recently, in support of specific program objectives major microcomputer facilities have been developed. A 23 station microcomputer lab is now supporting the Computer Systems Technologist program and a number of other programs. A 16 station lab has been established at KEC in support of College Foundations, the pre-college academic program. Continuing Education is utilizing for instruction, a nine station facility attached to the library at KEC.

Unlike some institutions, microcomputer additions have been made in consultation with the Computer Services Department. By July 1984 the College had acquired over 90 microcomputers for instructional purposes. (See Appendix E).

The acquisition of microcomputers and their use should not overshadow the effectiveness and the efficiency of the larger computing facilities in supporting instruction. Minicomputers such as those VCC has acquired can support multiple users through both printer and CRT terminals located throughout the College. The minicomputer can operate more complex and sophisticated software than can most, if not all, microcomputers.

Nevertheless, microcomputers, are appearing in many business situations as a multiple task work station. In addition, more and more individuals are acquiring their own equipment and need training in effective use.

VCC is discovering, as are other educational institutions and many business and industrial firms, that networked microcomputers are effective in multiple user situations. Linkages of microcomputers in lab configurations have already been established in the College for instructional purposes. Networked microcomputers and microcomputer labs in communication with the College minicomputer facilities can provide still more flexibility and capacity.

3. THE FUTURE OF INSTRUCTIONAL COMPUTING AT VCC

In the light of the rapidity of technological change that is occurring in the occupations and the educational sector that the College serves, VCC has managed to keep abreast reasonably well. However a recent campus-based assessment of computing and microelectronic applications needs in the immediate future suggests that large scale re-equipping and instructor up-grading will be necessary in the near term (Appendixes A- D).

3.1. Computer Related Training

The study shows, for example, that, among those VCC programs directly related to computing, the Data Entry and Junior Computer Programmer Programs at VVI are equipped well enough to meet present needs but that the Computer Electronics Program will have significant annual equipment needs in order to stay current (Appendix A). The Computer Systems Technologist Program, the Langara Campus based program developed cooperatively with VVI, has adequate microcomputer equipment for the present but has identified a need for both terminals and microcomputers for learning material development. (Appendix D) Resources to support the computer-related training programs probably can be identified and acquired for the near term. Equipment has been purchased recently. Instructors have undergone or are undergoing upgrading. Necessary learning materials, software, periodical literature, etc. while not equal to demand seem to be adequate.

3.2. Computer Applications Training

This category presents the largest challenge to VCC. Many program areas are undergoing change. Further information about the need is identified in Appendixes A through D. Following are some highlights. VVI has identified several programs in need of major re-equipping. The Machinists Programs must begin to integrate computer numerical control systems into the training. The approximate cost to purchase the equipment and software is estimated at $350,000. Power Engineering Program personnel have identified the need for computer-related curriculum changes affecting an additional 20-25% of the program over and above that which is already computer-related. The estimated cost is $150,000-$300,000. Printing Production and Graphic Arts Apprenticeship Training Programs are producing graduates for a rapidly changing occupation. New equipment to provide currency could range in cost from one half to one million dollars. These three programs need major equipment changes. Business and Office Training programs, Word Processing, Bookkeeping and Accounting, Clerk Typist, Secretarial, while not needing quite the same levels of equipment change as those mentioned above are in equally desperate need of curriculum development to prepare students for a changing office environment. Students graduating from business and office training programs need further introduction to and training in the use of computer-based equipment and software.

While VVI has the major proportion of business and office training programs, both Langara Campus and KEC have related programs. The Accounting Program in Business Administration Department at Langara has identified curriculum change areas which need computer support. Equipping a lab for that purpose could cost approximately $250,000. The Small Business, Marketing and Sales, Finance and Investment and Business Management programs at Langara Campus have identified computer applications not presently included in the curriculum, and required to support student training. KEC, which teaches basic business and office skills in its Business Education section, has identified the need to train entry level students in keyboarding. In addition, these students require an introduction to word processing and spreadsheet applications. While some equipment is available, more is required and appropriate software must be accumulated and instructors trained.

Most programs offered at VCC are being affected by the inclusion of computer-based systems in the workplace. The Journalism Program must introduce students to computer-based editing and word processing. The Library Technician students require training in computer circulation procedures and computer-based cataloguing and Art and Merchandizing students will be faced with the growing impact of computer generated graphics in their occupations.

3.3. Computer Literacy

All centres within VCC have been developing aspects of computer literacy training. Continuing Education, for example, uses terminals and microcomputer resources throughout the College and off-campus. (see Appendix B) Continuing Education course developers have identified high community interest in computer introduction courses but also note that students without specific learning goals tend not to continue beyond the introductory course. While resources are not adequate, Continuing Education has been creative in arranging for access to computers. Contract relationships have been worked out with Zenith/Heathkit to install a nine station lab on the King Edward Campus. In addition, access has been arranged with Quantum Research to utilize their IBM Personal Computer facilities. The cost of access to both of these facilities is included in student fees.

Other instructional centres have been active in supporting computer literacy training. VVI is developing and delivering a instructor computer literacy program (see Appendix G). KEC is providing its College Foundations Program students with introductory computing skills. Langara Campus has organized some instructor computing literacy activities.

It is difficult to predict the levels of demand for computer literacy courses in the long term in the Vancouver region. As noted in the introductory section on computer literacy (See Section 1.6) demand will undoubtedly continue but at reduced levels. Facilities developed and used for literacy are being shifted to computer applications training already as demand lessens.

3.4 Computer Assisted Learning

In the 1970s VVI introduced computer assisted learning (CAL) as support to a considerable number of its programs. The "experiment" was not a success. Software was developed for drill and practice and run on the College mini-computer. Terminal access was provided in the VVI library. Only a few instructors were available to be trained in the software utilization. All too often students were placed in an independent study situation without adequate tutorial support. The useage declined and students began to avoid the resource. In 1982 the project was closed.

Although some of the same problems can be inherent in commercially developed CAL software, considerable conceptual development has taken place. The best of the programs are well designed pedagogically, textually and visually. While drill and practice software still has the major share of the CAL pie, more simulations and conceptual programs are being developed.

All areas of the College are beginning to express renewed interest in CAL KEC, in particular, sees significant potential in existing CAL software packages available at the secondary school level. The College Foundations and Adult Basic Education Programs are obvious users. In order to support a major thrust toward CAL at that campus, equipment and software installations and purchases will be necessary.

3.5. Computer as Student Tool

Arts and Science transfer courses foresee increased utilization of the computer as a tool for learning. Langara academic course instructors have identified, in addition to those already underway, a number of instructional programs where student access to computing resources will increase learning effectiveness. Some of these programs are based in the word processing capacities of the computer, some in graphics, some in statistical analysis. Courses in economics, geography, psychology, anthropology, communications and English can be made more effective for the student who has computing access and skills.

Students taking College Foundations courses can also benefit from instruction which places emphasis on the use of the computer as a tool. Introductory analysis, graphics and word processing skills instruction can be further integrated into this pre-college curriculum.

At present a 16 station Commodore 64 lab is being used by KEC students in College Foundations for a growing number of applications. Langara students are utilizing terminals connected to the Prime minicomputer. As curriculum is changed and adapted to computing, existing facilities will be hard-pressed.

4. RECOMMENDATIONS

Like most of the post-secondary institutions in North America, VCC is facing a continuing challenge to keep up with rapidly changing technology. Major re-equipping is probably necessary to provide students with adequate training in computer-based applications in most of the College programs. New training programs will probably need development as new occupations emerge. Efficient educational systems utilizing CAL and the computer-as-tool need to be assimilated.

The challenge can be divided into several subsidiary problems:

1. Program Planning and Community Liaison
2. Instructor Development
3. Instructional Objectives and Computing
4. Curriculum Development and Delivery
5. Planning for Instructional Computing Development
6. Accessibility, Security and Communications
7. Organization in Support of Instructional Computing
8. Equipping, Maintaining and Financing Instructional Computing

4.1. Program Planning and Community Liaison

Program Advisory Committees, representing employers in the occupations served, are playing a pivotal role in the adaptations that are taking place in VCC of curriculum to new technology. For example, the Electronics Program Advisory Committee has been central to the development of the new Computer Electronics Program and has assisted in providing opportunities for instructor development related to the new program. In addition, the Journalism Program Advisory Committee has identified clearly the need to provide computer-based editing experience for journalism students. Further, industries and businesses in other occupational sectors have been cooperative in providing for instructor up-grade in rapidly changing technical areas.

It would be useful, in order to support a coordinated, prioritized deployment of scarce developmental resources within the College, to conduct regular assessments of employers to identify the new competencies that will be needed by graduates in occupational programs. Such assessments may be College initiated surveys of employers or may utilize information collected by other agencies interested in technological change and development in the Lower Mainland.

4.1.1. Recommendation:

Regular assessments to identify new competencies related to occupational areas within VCC's instructional mandate should be conducted by the College.

Resources for such assessments are, at present, extremely limited within the College. In addition to making use of the work of agencies within the community with similar interests, consideration should be given to enhancing existing institutional research capabilities by consolidation of mechanisms which will support precise, targeted assessments.

One such mechanism for narrowing the field of investigation is to convene a small group of employers to assist in the task by identifying occupational sector utilization of advanced technology. In the fall of 1983, VCC cooperate with the City of Vancouver and the research and planning arm of CEIC to bring together representatives of those groups and major Lower Mainland Employers to discuss employment training needs and trends. The day-long meeting, supported by documentation supplied by the College, the City and CEIC, allowed the exchange of information about training for jobs affected by changing technolog between College representatives and employers. Such communication concerned with major occupational trends in the Vancouver area should take place between the employers and the College regularly.

4.1.2. Recommendation:

Major regional employers should be brought together by the College regularly to assist in identifying occupational areas undergoing rapid change for which training curricula must be revised or for which new programs may be developed.

Such a group may best be convened formally and thus be an employers advisory group acting as an "advanced technology council." A council may also be of assistance in developing collaborative projects with companies who may benefit from state-of-the-art training of future employees. Both the College and employers are recognizing that major expenditures will be necessary to re-equip in order to reap the productivity benefits of microtechnology. The instructional expertise of the College may be deployed best in occupational sectors where company or industry support for College re-tooling for training can be organized.

4.1.3. Recommendation:

The College should actively pursue some highly visible collaborative arrangements for state-of-the-art training with companies in order to encourage other firms in the Vancouver area to such mutually beneficial collaboration.

Rationalization of Lower Mainland college and institute educational opportunities is of high priority. There is a feeling that the issue has not been satisfactorily resolved. The changing educational and training needs related to the introduction of microtechnology, in addition to providing a reason for collaborative arrangements with industry because of costs, provide a reason for further alliance and further rationalization of high technology related training. Opportunities for developing and identifying occupational sector areas of emphasis among the five colleges in the Lower Mainland and the several institutes must exist in this period of change. Certainly VCC has taken steps to provide training in computer assisted drafting or design. The College, also, can play a significant role in serving the massive business and office skills training and retraining market which is developing as a result of the increasing pace at which microtechnology is predicted to enter the office systems of the downtown core.

VCC will continue to assess and identify the education and training needs of its service area but since communication and travel within the Lower Mainland transcend political and college boundaries; since all of colleges and institutes in the Greater Vancouver region have similar service objectives and since the costs of introducing new or revised high technology into training is high, efforts must be made to reduce duplication or share development costs.

4.1.4. Recommendation:

VCC should take a leadership role in developing formal relationships with colleges and institutes in the Lower Mainland with the objective of planning the establishment of curriculum areas of concentration for advanced technology training and of sharing the development resources where overlapping programs are necessary utilizing microtechnology.

4.2. Instructor Development

Prior to further introduction of computer technology into VCC program curricula it is likely that a large scale employee development must occur. A number of steps toward technological up-grading have been taken by individual faculty and groups of instructors. Some support staff have also received

training in aspects of administrative or instructional computing. VVI has introduced a Computer Awareness Program for all VVI employees. (see Appendix E) It is a seven course program which is delivered by individualized self-study modules, with tutorial assistance and hands-on computer activity. It starts with a basic introduction to computer concepts and includes word processing, BASIC programming introduction, instructional admin- stration applications and other more advanced applications. The first groups began to move through the courses in the summer of 1984.

In addition, a number of instructors have undertaken programs of study to assimilate the computer applications specific to their curriculum. Accounting instructors, for example, have received training in spreadsheet applications. Drafting instructors are learning CAD applications.

The magnitude of the retraining task and the specific needs of the instructors of the College have not yet been identified in detail. In order to better understand instructor perceptions of the computer related changes that are taking place in the future occupations of their students and to better understand the computer related additional training that those instructors will be needing, a survey is being conducted among College faculty (See Appendix F). The results of that survey are not expected until December 1984. Specific recommendations in instructor development will be made following the analysis of the survey. Nevertheless, it can be said that there is a large task ahead for VCC in assisting to bring to currency instructors who are educating or training in programs undergoing rapid change.

While retraining or further development of instructors is the most important task, in some program areas the recruitment of up-to-date instructors from industry is necessary. This is especially true for part-time upgrade courses which may require state-of-the-art advanced instruction. Such individuals with the technological currency, instructional skills and the desire to teach are not easy to locate. Program Advisory Committees can be of assistance in identifying likely instructors. However, the college is taking steps to play a more active role in providing such part-time instructors with

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instructional know-how. In addition to the Instructor Diploma program conducted cooperatively with UBC Continuing Education, VVI is developing a "Train the Trainer Program" to assist in providing instructional skills to trainers.

4.2.1. Recommendation:

Based on information about changing occupational training and educational methodology, plans by the college should be further developed to assure instructor currency.

4.3. Instructional Objectives and Computing

Considerable experience has been built up by instructors and instructional managers within VCC in the development of instructional objectives for programs offered by the College. A number of programs have integrated appropriate microtechnology skills into those objectives. However, it would be helpful to have a College statement of objectives relating to instructional computing as guidance in such curriculum development or revision and in the administration of resource allocation.

4.3.1. Recommendation:

The College should develop a general statement of instructional objectives in relation to computing as a guideline for program objectives and resource allocation.

4.4. Curriculum Development and Delivery

As well as assisting in the development of an instructional cadre that is knowledgeable in the utilization of computing in training and education, the College faces the significant task of assisting in curriculum revision. In order to develop curriculum for a revised program in which computer applications are integrated or to develop a new high-tech program instructors must spend time on the activity. Major development often requires release time in addition to the presently available time for such projects.

4.4.1. Recommendation:

Resources must be gathered and deployed by the College through a variety of mechanisms such as: industry financial support; Skills Growth Funding, productivity gains; and etc. to support the continuing need for curriculum revision and development as a result of the impact of microtechnology.

Computers can be of assistance in the delivery of instruction. As noted previously the first "computer-university" is registering students. Productive delivery methods must continue to be explored. VCC is utilizing computer-base self-paced training in its Computer Awareness Program. It is important to be aware, however, that microtechnology-based training usually requires "hands-on" learning experience for students. Where such learning is not

directly occupation related or where job sites do not easily lend themselves to direct experience this must be acquired in the College setting. In other instances the workplace is ideal for such hands-on learning. VCC has developed a highly successful cooperative program in the computer-related occupational sector. Other such programs must be sought.

4.4.2. Recommendation:

The College should continue to actively pursue computer-based alternative and non-conventional instructional delivery systems both for the productivity opportunities they may present and for the opportunity to provide enhanced learning experience for the students.

4.5. Planning for Instructional Computing Development

A thorough understanding of occupational requirements in the Vancouver region as they may affect College programs; a technologically knowledgeable faculty and the establishment of general and specific objectives in relationship to computing are all prerequisites to development of a College plan for computing development.

It is necessary to add an additional component to the mix. A mechanism must be at hand to provide information on the details of program needs; to those responsible for instructional computing development; the availability of space and the priorities of use and the effectiveness of computing resources and services in meeting instructional needs. Such information needs to originate from the College's instructional centres and be provided to the Computer Services Department for coordinated action.

4.5.1. Recommendation:

A standing committee for computer planning and utilization should be established with administrative and instructional representation from all centres of VCC to address and advise on instructional computing needs and development.

Some work has been undertaken by campus and continuing education personnel to address the instructional areas which require improved computing support, curriculum revision or development of new computer applications programs. Further planning and development is needed. For example, the role of CAL in adult basic education requires more research. The priorities to be given to the introduction or provision of resources in support of the integration of computing applications into existing courses and programs must be addressed. The expectations of the College of a level of computer literacy for entering arts and sciences students needs consideration. The resources expected of the student to support use of the computer as a tool must be reviewed -- probably several times in the next few years. These and a number of other issues and problems should be addressed by the instructional centres as components to a comprehensive plan for instructional computing.

4.5.2. Recommendation:

The instructional centres of the College should develop plans for introduction and development of instructional computing in the context of overall College instructional computing objectives. Such plans should be five year based.

Since resources will be limited and the College has some continuing space constraints, concern for the configuration of computing resources and their scope must be addressed. Four elements can be considered in the distribution of computing resources in VCC: distributed support; central computing facilities, portable capabilities and external computing support.

Instructors must have access to develop computer-based curricula and to work on computer related professional interests. Some of these activities can take place in central computing facilities and with portable equipment. It is also justifiable and wise to consider the deployment of minimum hardware to support instructors where classrooms and offices are located. Either or both interactive terminals and microcomputers should be available for distribution to instructors, especially during periods of curriculum revision or development.

4.5.3. Recommendation:

Instructional centre plans should address the priority of deployment of equipment for instructor use during periods of curriculum work or program development.

As VCC is discovering, students are requiring increasing computing capabilities, accessible at a considerable span of hours during the day and flexible enough to support different instructional program needs. Even though constrained by space and lack of capital funding, the College has put together an instructional word processing facility; four microcomputer labs and three facilities providing terminal access to the VCC minicomputer. These resources are supplemented, of course, by more specialized facilities such as the CAD facilities. In addition terminals and microcomputing equipment are placed in small numbers to support limited curriculum objectives where short assignments can be scheduled throughout a program or course term.

This variety of computing support is necessary. Students require, because of the variety of program demands, access to interactive terminals (both CRT and hardcopy); microcomputers; software access and manual reference material.

4.5.4. Recommendation:

In recognition of the need for both instructional class and independent study access to computing resources by students, the College will continue to provide various computing resources for student use in central facilities and to maximize access.

Portable computing facilities are a useful mechanism in some instructional situations. Both terminals and microcomputers can be made available in the same way as are overhead projectors. Carts with large screen monitors are successfully being utilized at Kwantlen College. VCC has taken only limited steps to provide such facilities because of budget constraints. It is recognized that classroom portable terminal use requires wired jacks. The College was able to include broad band cable in the development of all three campuses during recent construction and renovation. This cable will support a digital network. However, the necessary interface hardware to support network communication has not been purchased to make possible utilization of the cabling for data transfer. The cost of completion has been estimated at $56,000. Installation of alternate wiring or telephone access in classrooms are other options with major cost implications.

4.5.5. Recommendation:

The College should capitalize on the existing elements of local area network at each campus to support more flexible classroom access to computing by completing the system and also provide a small pool of mobile microcomputers for classroom use.

Much of the external computing facility use at VCC is administrative. The College payroll, for example, is processed on the SFU computer. However, some instructional computing activities must also take place on external computing facilities. For example, the Realty Appraisal Program has terminal access to the Greater Vancouver Real Estate Board Vandat system. Vandat is the database listing all multiple listing sale properties. It is an invaluable tool for Realty Appraisal students and is required for their training. The Library Technician Program provides access to the bibliographic database used for cataloguing library materials at many libraries in B.C. Many library technicians will work in library cataloguing facilities and must have computer based cataloguing experience. Such external computing use will grow as programs integrate computing into instruction.

4.5.6. Recommendation:

External computing access must be provided where appropriate and within priorities to support computer related instruction in VCC programs.

4.6. Accessibility, Security and Communications

The College's minicomputer facility is located on the Langara Campus. Both VVI and KEC are linked with data communications lines provided by B.C. Tel to that facility. Because regular voice communication telephone lines have levels of noise or static that will distort electronic data communication, special data communication lines are leased by the College.

At present, the costs of alternatives to such leased lines seem prohibitive. College-owned lines and microwave links are reviewed as possibilities but, for the present, require large capital investment. Nevertheless, electronic data communication is a rapidly evolving technology and costs are diminishing rapidly. In addition, telephone line costs may be undergoing increases as newly structure tariffs are introduced.

4.6.1. Recommendation:

The cost effectiveness of alternatives to telephone links for data transfer between the College's campus should be reviewed regularly to ascertain whether capital expenditures could result in significant long term savings.

The College's terminal facilities are available during a wide range of hours and during weekdays and weekends. This has been feasible because necessary minimum security has been available at the sites. While better security would reduce depredations, in general, the broad schedule and low level supervision has not been a problem.

The microcomputer facilities and more specialized facilities present a different order of security problem. Micros are extremely vunerable to theft and costly accidents. CAD and word processing equipment is equally vunerable to "accidents." As a result the supervision of such facilities has proven to be necessary. When not supervised, the facilities are locked and consequently there are significant amounts of time when the facilities are not available for use.

Greater utilization of computer resources could be effected if arrangements could be made to provide supervision for periods when instructors are not available. There are two extremes to such supervision. In one extreme, security provisions may consist of full-time staff available to monitor and provide technical assistance to computer users. The other extreme is simply a physical presence - someone to be available in the facility - who may be responsible for other work if that is feasible.

It should be recognized that the former - individuals to provide monitoring and technical assistance may be more effective. Students with technical problems and in need of advice are chronic in a computing facility. At the same time low level microcomputer down-time as a result of minor assistance as well as supervision would significantly increase the efficiency of the utilization of the microcomputer and word processing instructional facilities at Langara Campus, VVI and KEC.

4.6.2. Recommendation:

That a high priority be placed on the design of a "computer lab assistant" classification and the hiring of such individuals to increase the efficiency of the utilization of such facilities at all three College instructional centres.

4.7. Organization in Support of Instructional Computing

Support services to instructional computing include coordination or direction of College instructional computing development; technical assistance to instructors and students; general consulting on computer capabilities; educational consulting concerning the integration of computing into courses or programs or in connection with specific class assignments; instructor development; the provision of information to instructors about available instructional software; possible custom programming or assistance with instructor-based CAL development utilizing authoring systems; the provision or maintenance of documentation and instructional software and the supervision of computer lab assistants and maintenance personnel or contracts.

As noted previously, VCC has existing computing resources which include a number of operating programs, hardware, communications and staff support for instructional computing. Until recently the emphasis has been on interactive minicomputer and external time sharing and batch processing. The necessary introduction of microcomputers and related hardware is providing an alternative somewhat independent of the centrally controlled computing service operated by the Computer Service Department.

At present, the Computer Services Department staff resources, although somewhat enhanced to accomodate the recent additions of equipment, are largely allocated for the support of such operational priorities as payroll, accounting, and student records. Severely limited time can be apportioned to instructional computing. Such staff time as has been available has been directed to supporting new instructional resource developments including installing new microcomputers and word processing lab facilities in the campuses. Yet an increasing share of institutional commitments will be required to meet expanding computer-based curriculum activity. Instructional computing facilities use will grow.

This necessary committment of the Computer Services Department resources to operational activities has severely limited the availability of resources to many of the support activities related to instructional computing. The Department has been extremely creative in spreading overbooked personnel resources as effectively as possible to meet demands, but operational demands have had priority.

Instructional computing development needs continuing attention and direction in the immediate future within VCC. Specific services listed above are increasingly in demand. As the College moves to integrate microcomputing applications into more and more programs in response to occupational changes, computing resource acquisition and deployment consultation and decisions will require more attention. Further development or expansion of our instructional computing service staff is necessary. Already maintenance of present microcomputing facilities is presenting problems as existing staff who might diagnose problems is frequently otherwise employed.

Instructional computing services must share much of the College's computing capacity and staff resources with administrative computing. However, during this period of rapid development it will be necessary to provide a focus for instructional computing services as an instructional support service. Redeployment of some existing computing service resources; the development of additional resources to support instructional computing access, scheduling and efficient utilization and the establishment of a senior staff position within the Computer Services Department to provide College-wide service direction are fundamental steps in providing support for present and future instructional computing development.

4.7.1. Recommendation:

An instructional computing support service should be established to provide College coordination and delivery of instructional computing services. The service should be directed as College-wide support service.

This report has described ways in which computing is used in teaching and learning in colleges and more specifically in VCC. Consideration has been given to the impact of computing on curriculum and methods of instructional delivery. Computing does not stand in isolation in support of instruction, however. The established technologies of television, film, recorded audio and print are among the media being utilized in instruction in VCC. These information technologies will continue to be utilized by themselves and in association with computing and other media.

Organization of services in support of instruction may need review in the light of the need for coordination of all of the College's instructional support services. Two options present themselves:

- continue with the existing structure in which the Computer Services Department reports as an administrative service and develop a functional liaison with the College's instructional support services.
- reorganize the reporting to bring instructional support services together and provide a functional and service relationship in support of administrative computing.

4.7.2. Recommendation:

The reporting relationships of the Computer Services Department should be examined in the light of developing instructional computing services activity.

4.8. Equipping, Maintaining and Financing Instructional Computing

Standardization and compatability are important as the College moves to acquire additional microtechnology. This does not mean the purchase of only one brand or model of computer or settling on a single operating system The needs of the instructional programs are diverse. Already different microcomputers are being used in programs with different objectives. All new computer items should continue to be reviewed by the Computer Service Department. Documentation should be standardized for all hardware and software to provide a coordinated cost effective approach to acquisition. Inventory of computing resources should be completed according to a standard format.

Instructional objectives should lead to software identification and thus to equipment options. Nevertheless, equipment compatability within broad groupings can effect savings and the accumulation of unnecessary and unique equipment should be minimized.

The College Purchasing Department must continue to be responsible for administering the purchase of all computing equipment. Liaison between the Purchasing Department and the Computer Services Department has been effective

The accumulation of increasing amounts of computing equipment also increases maintenance requirements. Very little computer electronic maintenance staff capability exists at present within the VCC staff complement. Instructional Media Services has one maintenance technician with some computer electronics training. Some maintenance capability at the operational level exists within the Computer Services Department.

Systems should be further developed to provide an information base to identify repair incidence and to analyse service needs and costs. Service and maintenance contract costs should be balanced against developing College-based expertise in computer maintenance with attendant potential improvement in response time.

4.8.1 Recommendation

Through development of in-house capabilities and/or contract services, computing resource maintenance needs should be improved to meet instructional computing requirements.

The question as to how much money colleges should be spending for instructional computing support can only be answered in the context of goals set by individual institutions. Additional planning and priority review must be undertaken by VCC before fiscal support levels can be determined. However, initial surveys of campus needs suggest that instructional computing development in the next few years will require in excess of $4,000,000 capitalization. New programs being investigated could add an additional $6,000,000 of capital needs.

Sources for such funds in the past, have included special funds from the Ministry of Education to support the development of new courses or programs. Federal funding has been disbursed through Skills Growth Funds and other mechanisms. Continuing Education has been successful in lease arrangements with lease costs recovered through tuition. These and other methods, including the development of collaborative cost sharing arrangements with business and industry must be utilized to find the necessary funding for equipment. In addition, operating funds must be deployed to carry out the retooling of instruction for microtechnology.

4.8.2. Recommendation:

Identification of funds to support the updating of VCC programs in the next few years should be a high priority directed to equipping instructional programs to meet the impact of computing.

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APPENDIX A

VVI INVENTORY OF COMPUTING REQUIREMENTS

Preliminary Survey July 1984

VANCOUVER COMMUNITY COLLEGE

MEMO

Central Administration
King Edward Campus
x Vancouver Vocational Institute
Langard Campus
Continuing Education

Date 1984 July 24
To C. R. Carter
From M. E. Lamoureux
Subject INSTRUCTIONAL COMPUTING COMMITTEE

In response to the "inventory of plans for program or course development" which will involve computer resources, I am submitting the following information:

1.0 At the outset it should be noted by the Computing Committee members that the VCC/VVI Management Committee has unanimously passed a motion that every program at V.V.I. will, within the next two years, include a defined computer literacy course or computer literacy topic within one or more designated courses. This, of course, means that the expected overall demand at V.V.I. would be approximately 12,500 full-time students per year times an average of 30 hours computer literacy training for 375,000 hours per year. Additionally, the V.V.I. conducts part-time credit courses to approximately 4,500 extension students in any one fiscal year. This introductory form of education is beyond the specialized computer training as it relates to specific course and/or program needs discussed below.

2.0 A computer awareness program for staff, instructors, educational managers and administrators has been developed by the Program Development Department. This program has 7 courses (see attached) and it will be expected that all V.V.I. employees will be taking one or a portion of these courses during the next two years. If one assumes, including part-time Instructors, that approximately 400 employees will take 100 hours worth of training in the next two years then approximately 40,000 hours of employee computer awareness training will occur.

In both 1.0 and 2.0 above, the V.V.I. would need more facilities and equipment devoted to these objectives.

The most likely need would be a separate Instructor training room with its own equipment (see 2.0) and a doubling of present instructional capacity at the V.V.I. to achieve 1.0.

3.0 COMPUTER RELATED COURSES AND PROGRAMS ARE DISCUSSED BELOW:

3.1 Data Entry Operator

This program has just acquired a new stock of equipment and will

not need any further resources for approximately two years. It has 21 stations and is able to meet its present program needs as well as related data entry training needs in other Business/Secretarial Programs;

3.2 Junior Computer Programmer

This program also has an adequate amount of equipment and its facilities are under the control of the Director of Computer Services (Jim Goard) and it would be his decision over the next 2 - 3 years to increase or change the amount of equipment depending on the growth of this and related programs;

3.3 Computer Electronics

This program has had a fantastic growth and encompasses six streams of training. I am under the impression that equipment, to the value of approximately $100,000 per year, will have to be re-ordered to cope with the state of the industry. The College has been fortunate in acquiring R.A.C. money, but I believe that this infusion will now cease and become the College's responsibility;

3.4 Electricity Upgrade

This program is made available to Journeyman Electricians and uses micro processors and computers relative to the electrical industry. Because of the move towards electronics in the electrical industry, this program is expected to continue to increase and I expect that significantly more computer-related equipment and software will be needed, This will be approximately a $100,000 cost per year for the next three years. At the present time, the equipment has been financed through R.A.C.'s, but I am concerned that growth in this type of training will be functionally related to the ability of the College to acquire more computer related equipment through its own internal resources.

3.5 Word Processing Operator Program
Advanced Word Processing

These programs totally depend on a wide range of word processing operator equipment. Based on the changeover of equipment and software, it is necessary that approximately $50,000 a year would be needed to continually upgrade the program in order to meet industry needs. In addition, an up-front $300,000 new equipment capitalization would be needed. These dollar amounts reflect the Business Department's request to restructure these programs and develop and offer a range of specilaized "office automation" short but highly technical (software and equipment) programs. Pressures from industry, M.O.E. and C.E.I.C. are adding further pressure in this direction.

4.0 COMPUTER APPLICATION COURSES AND TRAINING:

4.1 Bookkeeping
4.2 Accounting

In the next 6 months both of these programs will be completely revised to include at least 1/3 of the students' time on micro and mini computers. For the next year I believe we have an adequate amount of equipment to service the program needs. I would however, be concerned that the growth in the use of computers, once the Instructors become fully knowledgeable, could lead to a doubling of the use of this equipment. Thus I would predict that a $100,000 capitalization would be needed.

4.3 Clerk-Typist
4.4 Secretarial
4.5 Legal Secretary
4.6 Medical Office Assistant
4.7 Medical Stenographer
4.8 Dental Receptionist

All of these programs presently use word processing machines for about 20% of the instruction. Within the next two years this percentage is expected to rise to approximately 50% and the use of micro or mini computers is expected to rise from zero to approximately 15% of the program. Again, with this expected use of facilities and machines, I believe that a major infusion of software and equipment will be needed in order to meet the minimum "office automation" requirements of these programs;

4.8 Dining Room and Lounge Service Program
4.9 Dining Room and Lounge Supervisory Program
4.10 Kitchen Management Program

These programs are now training students on computers and electronic cash registers.

The students will also have to have a computer assisted and data processing course and will have to begin to understand the use of computer systems within the food trades industry. Although presently only about 5% of the training is related to computers, I believe that within the next two years it will be approximately 20% (infusion of restaurant-related software - approximate cost of $25,000 will be needed to achieve that goal);

4.11 Drafting - Basic and Architectural
4.12 Drafting - Civil and Structural
4.13 Drafting - Materials Handling and Process Piping
4.14 Drafting - Structural Steel Detailing

In all of the above programs computer aided drafting will constitute approximately 20% of the training. The College has ordered 1/2 million dollars worth of equipment and software. This should satisfy the near term need of the pre-employment programs.

In addition, the Drafting Department will be making major strides into computer aided drafting, design and manufacturing upgrade training. I suspect that another 1/4 million dollars worth of equipment and software will be needed within the next two years so that this market will be achievable by the College;

4.15 Electricity - Basic
4.16 Electricity - Industrial Electronics

These 2 programs have about 10% of their training within the computer and computer-related field. Based on present industry needs and expected changes over the next two years, I expect that this percentage rate will rise to 20% in the Basic Program and 40% in the Advanced Program. Present estimates (see 3.4) would indicate that about $300,000 worth of new computer-related equipment and software related to the Electricity industry will be needed to achieve that goal. This would be used concurrently with 3.4.

4.17 Electronics - Basic
4.18 Electronics Technician

These 2 programs constitute a potential and immediate growth for use of computer-related training. Presently in Electronics - Basic about 15% of this training is related to computer/micro processors and in Electronics Technician about 30%. I am expecting that the Electronics - Basic will rise to about 30% and Electronics Technician to about 50%. The cost for equipment and software over the next two years will be approximately $200,000 to $500,000. The reason for this figure is the sheer number of Basic and Technician classes.

4.19 Hairdressing
4.20 Men's Hairstyling

Both of these programs have no computer-related training except electronic cash register training. Based on Program Advisory Committee recommendations, it would appear that some computer systems/inventory management training will be needed. I suspect that within the next two years I would need approximately $20,000 for industry-related software. I do not believe any equipment is needed if the Business Department gets an infusion as previously discussed.

4.21 Hospital Unit Assistant

This particular program does not have computer or word processing-related training. However, with the adoption of office automation needs on the nursing and emergency wards of hospitals, I suspect that some major re-organization will have to occur and that training on word processing machines and computers as the software would relate to hospital needs.

4.22 Machinist - Basic
4.23 Machinist - Advanced

Computer training in these 2 programs is related to numerical control machines. Although only 5% of the training in both programs is presently related to this training, the Department Head wants to totally revamp both programs and create a computer numerical control upgrade program. In order to accomplish this objective, which is a College and national priority objective, approximately $350,000 worth of new equipment and software will be needed. It is my opinion that the number of new computer-related programs derived from CNC and CAD equipment (with software) is immense. The key is to acquire the equipment quickly (within one year) so that the upgrade/journeyman market can be attracted. This training would also be tied-in with computer aided drafting equipment as mentioned before. In addition, the CNC and CAD-related training is a national priority.

4.24 Marketing - Micro Technology Program

Approximately 30% of this program is devoted to computer systems and computer programming (basic training). There is, presently, enough equipment to satisfy the training needs and I see no particular increases in this area.

4.25 Practical Nursing Program
4.26 Nursing Orderly Program
4.27 Nursing Aide Program

Although these programs do not conduct any computer-related training; with the defined bedside computer diagnostic equipment in hospitals and long term care agencies, it would appear that over the next two years the College probably will have to invest approximately $100,000 in this hospital-related equipment in order to familiarize the students. Because of the lack of training in the industry, this equipment would also be used to develop upgrade programs for nurses and auxiliary personnel within the Lower Mainland.

4.28 Power and Process Engineering Program
4.29 Power Engineering - General
4.30 Power Engineering - Technical
4.31 Power Engineering - Upgrade

In all of these programs about 20% of the training is presently devoted to computer-related needs. Again, the industry growth towards process engineering techniques and the fact that the Department Head has taken a Computer Electronics course would assume that computer-related training in all of these programs will rise to approximately 40 - 45% in the next two years. Based on the number of students and their technical needs, equipment and software infusion will be needed to meet the particular needs of these programs. The estimated cost will probably be in the $150,000 - $300,000 range (depending on the level of process engineering-related training).

4.32 Printing Production
4.33 Graphic Arts Apprenticeship Training

These programs have about 20% of their training devoted to computer-related needs. I expect that this percentage rate will rise to approximately 25% over the next year, however, the cost of the new machines will be in the neighbourhood of 1/2 million to one million dollars. These costs are typical in this particular industry and it would appear that the direction in the near term is that the College will have to react.

4.34 Junior Travel Agent Program

About 15% of the program is devoted to C.R.T. training and approximately $5,000 is immediately needed for equipment and data lines to one of the major airlines so that the program can exist on a continuing basis for training.

In conclusion, I am aware that approximately 10 - 15 computer-related training programs are now in the process of being developed in the V.V.I. Electronics, Power Engineering, Drafting and other similar Departments. These programs will cover a wide range of instruction and, in comprehensive sense will bring V.V.I. into a high-tech profile in both the pre-employment program area and upgrade programs. The cost will most likely be in the $5 million range.

5.0 CAL APPLICATIONS

None at this time. V.V.I. Experimented in an extensive manner about 5 years ago and found it too impractical. The need is everywhere in the College (productivity) and I would recommend a special sub-committee to investigate computer-aided learning costs and benefits.

M.E. LAMOUREUX
Dean of Instruction

MEL/ds

(Attachment)

c.c. H.W. Rerup
A. W. Griffiths
S. F. Hartley
B. A. Wood
R. J. Wren

APPENDIX B

CONTINUING EDUCATION INVENTORY OF COMPUTING

July 1984

COMPUTER SKILLS TRAINING

KING EDWARD CAMPUS

For the following courses held at the King Edward Campus, you pre-register by September 12, 1984 at King Edward Campus, 1155 East Broadway, 9:00 a.m. to 8:00 p.m., Monday to Thursday and 9:00 a.m. to 3:00 p.m. on Friday. Courses marked * feature the COMMODORE 64 COMPUTER in our computer classroom. Courses marked ** feature HEATHKIT-ZENITH DATA SYSTEMS in our Computer Study Centre and are a cooperative venture between V.C.C. Continuing Education and Heathkit Computer and Electronic Centre. All classes start the week of September 17, 1984 unless otherwise noted. For further information on these K.E.C. courses, please phone 875-8200.

WORD PROCESSING 75.00

A hands-on Word Processing course designed for those who wish to learn the art and in the process grasp basic computer ideas. The course is limited to nine persons (one computer each which will also be available outside of classes). Magic Wand will provide the software base for this course.

Tues.	K.E.C.**	1:30-3:30 p.m.	8 sessions
Thurs.	K.E.C.**	10:00-12:00 Noon	8 sessions

INTRODUCTION TO THE COMMODORE 64 75.00

Find out some of the things your Commodore 64 can do for you. This course is designed to give you an overview of the Commodore 64. Topics will range from the History of Computers to Programming. Some of the software covered will be - Operating Systems, Word Processing, Spreadsheets, BASIC Programming, Database Management.

Tues.	K.E.C.*	6:30-8:30 p.m.	8 sessions
Thurs.	K.E.C.*	6:30-8:30 p.m.	8 sessions

ADVANCED "BASIC" PROGRAMMING 75.00

Designed for people who have some programming experience. This workshop will enable you to add structure and clarity to your programs, thus easing the whole programming task. You will learn approaches to problem solving as well as programming STYLE. You will be able to tackle large programming tasks with the same confidence you approach small programming jobs.

Mon.	K.E.C.*	8:30-10:30 p.m.	8 sessions

COMPUTERS IN ACCOUNTING 65.00

The world of accounting, whether for small or large business, is becoming computerized. The information processing capabilities of computers open many doors to accountants. The course will cover conceptual aspects as well as practical exposure to the use of computers and software packages, such as Super Calc.

Thurs.	K.E.C.**	7:00-8:30 p.m.	6 sessions

July 84.

CP/M (Control Program for Microcomputers) 65.00
The most popular operating system for microcomputers - CP/M. This is an introductory course in CP/M and its utilities. Having mastered this operating system a wealth of CP/M compatible software becomes easy to use.
Mon. K.E.C.** 6:30-8:30 p.m. 6 sessions

INTRODUCTION TO "BASIC" LANGUAGE PROGRAMMING 75.00
A computer programming language with the broadest of appeals. This course will take the student to the point of writing and using a variety of programs. Creating new programs or adapting existing software will be included in this in-depth course.
Mon. K.E.C.** 6:30-8:30 p.m. 8 sessions

INTRODUCTION TO COMPUTERS 75.00
A straightforward explanation, in everyday English of how a computer works and what it means to "PROGRAM" a computer. Topics covered will include a history of computing, factors to consider before buying, impact on society, and how to work with and in computing.
Wed. K.E.C.* 6:30-8:30 p.m. 8 sessions

COMPUTERS AT WORK 65.00
Learn to use a business microcomputer effectively. You need no prior experience to start with word processing, electronic filing, data entry and electronic spreadsheets.
Tues. K.E.C.** 6:30-8:30 p.m. 6 sessions

INTRODUCTION TO MICROCOMPUTER TECHNOLOGY 65.00
Learn the basics of microcomputers and programming. A straightforward approach to how microcomputers work and how to use them. Each session will offer an opportunity for hands-on experience. Topics will include: Hardware, Software, Firmware, Printers, MODEMS, BASIC Programming.
Wed. K.E.C.** 6:30-8:30 p.m. 6 sessions

DEVELOPING KEYBOARD SKILLS 55.00
Computer Based Instruction
An essential skill for any serious use of computers - data entry, word processing, and/or programming. This course is instructed by the computer at a pace established by the student. Develop typing skills to a level determined by your needs. Fee includes centre and course orientation, along with sufficient computer time to complete the course, 20 hours. Additional time available if required.
Dates and times assigned at registration K.E.C.** 20 hours

MICRO SOFT "BASIC LANGUAGE PROGRAMMING 55.00
Computer Based Instruction
An intensive course in "Basic" programming which takes you step-by-step through all the stages of skills involved in "Basic" programming. This "hands-on" approach, whereby the computer is your instructor, develops your ability to write and run programs in "Basic". Fee includes an orientation to the Study Centre and 20 hours of computer time. Additional time is available if required.
Dates and times assigned at registration K.E.C.** 20 hours

For the following computer courses held at QUANTUM RESEARCH, 4336 Dunbar Street, you register at King Edward Campus, 1155 East Broadway, 9:00 a.m. to 8:00 p.m., Monday to Thursday, and 9:00 a.m. to 3:00 p.m. on Friday. These courses are a cooperative venture between V.C.C. Continuing Education and Quantum Research, an established computer consulting and research company. The courses feature a one-to-one ratio of student to the IBM PERSONAL COMPUTER and are especially designed to meet current business computing requirements. All courses are taught by Quantum's computer applications consultants and are offered during the day as well as evenings. Class starting dates are listed with each course. For further information, please phone Continuing Education at 875-8200 or Quantum Research at 734-1878.

DATA BASE MANAGEMENT - dBASE II 110.00

Anything that can be filed can be organized with a database program. No experience necessary to start "hands-on" creating and maintaining a database for applications such as mailing lists, inventories and accounting. Emphasis will be placed on practical database design and implementation in relation to your specific database requirements.

Thurs.	Sept. 20	6:30-8:30 p.m.	4 sessions
Wed.	Oct. 17	6:30-8:30 p.m.	4 sessions
Mon./Tues.	Sept. 17/18	9:00-4:00 p.m.	2 days

COMPUTER ACCOUNTING - ACCPAC 110.00

ACCPAC is a very versatile and popular accounting software package for microcomputers. This course uses "hands-on" examples to follow the steps required to computerize your accounting requirements. Topics covered include: general ledger accounts, transaction entry, posting, archiving and financial statement preparation. Some bookkeeping or accounting knowledge is desirable.

Mon.	Sept. 17	6:30-9:30 p.m.	4 sessions
Tues.	Oct. 16	6:30-9:30 p.m.	4 sessions
Thurs./Fri.	Sept. 20/21	9:00-4:00 p.m.	2 days

COMPUTERS IN THE WORKPLACE 110.00

This course is designed to provide a general understanding of the many uses of microcomputers in business. You need no prior experience for this "hands-on" introduction to word processing, accounting, database management and electronic spreadsheets.

Wed.	Sept. 26	9:00-4:00 p.m.	2 sessions
Sat.	Sept. 29	9:00-4:00 p.m.	2 sessions

WORD PROCESSING - WORDSTAR 110.00

Your current typing skills can be readily upgraded to meet the word processing requirements of today's computerized office. This "hands-on" course is designed to introduce the fundamental word processing skills required most often in business applications.

Tues.	Sept. 18	6:30-9:30 p.m.	4 sessions
Thurs.	Oct. 18	6:30-9:30 p.m.	4 sessions
Thurs./Fri.	Sept. 27/28	9:00-4:00 p.m.	2 days

ELECTRONIC SPREADSHEETS - LOTUS 1-2-3 110.00

Learn how to use LOTUS 1-2-3 for a variety of business applications. You will develop spreadsheets in a number of areas including cost projections, financial analysis, budgeting and inventory. No previous experience is necessary for this "hands-on" course.

Wed.	Sept. 19	6:30-9:30 p.m.	4 sessions
Mon.	Oct. 22	6:30-9:30 p.m.	4 sessions
Mon./Tues.	Sept. 24/25	9:00-4:00 p.m.	2 days

INTRODUCTION TO IBM PERSONAL COMPUTERS 55.00

This course is specifically designed for owners or prospective purchasers of an IBM or IBM-compatible microcomputer. No previous computer experience is necessary for a "hands-on" introduction to this powerful business and personal computer.

Wed.	Sept. 19	9:00-4:00 p.m.	1 session
Sat.	Sept. 22	9:00-4:00 p.m.	1 session

For the following directed independent study computer courses held at the King Edward Study Centre register at King Edward Campus, 1155 East Broadway, 9:00 a.m. to 8:00 p.m., Monday to Thursday, and 9:00 a.m. to 3:00 p.m. on Friday. V.C.C. Continuing Education in cooperation with Heathkit/Zenith offer these "learn at your own pace" courses consisting of comprehensive print materials, audio cassettes, a final examination, a "hot-line" instructor access service, and optional "hands-on" access. Course fee includes all materials which are available for on-campus independent study at K.E.C. for $50.00, texts not included for off-campus use. For further information on these K.E.C. courses, please phone 875-8200.

"BASIC" LANGUAGE PROGRAMMING 115.00

"Basic" is the easiest computer language to write - and to learn. It uses familiar English words, which cause the computer to perform standardized operations. When you know "BASIC" you can adapt and run hundreds of existing programs to meet your specific needs, exchange computer programs with others and write your own.

K.E.C.

COMPUTER CONCEPTS FOR SMALL BUSINESS 115.00

When you consider making a computer investment that can run into thousands of dollars, you need to know alot about computers first! This course gives you a sound basis to evaluate intelligently how a computer can benefit you business. It covers The Computer and How It Works, Data Processing and Personal Application, Alternative in Computer Services and How to Select a Computer.

K.E.C.

PERSONAL COMPUTING 115.00

For the curious, motivated person uninitiated to computing. This course will show how a computer can serve you. You will be able to determine if your problem can be solved by a computer and understand what different computer components do - in easy simple terms. Learn how computers "understand" electronic data, how to convert written words into electronic data and how to evaluate various types of small computers.

ACCESS TO A COMPUTER AND SOFTWARE FOR YOUR OWN WORK OR LEARNING

Our Computer Study Centre has time available on a rental basis. State-of-the-art computer and a range of software including Word Processing, "Magic Wand" and Accounting, "Super Calc" for $5.00 per hour. Please call 875-8200, local 217 for more information.

APPENDIX C

KEC INVENTORY OF COMPUTING

REQUIREMENTS

Preliminary Survey October, 1984

MEMO

Date November 15, 1984.

From G. A. Pawelchak, Division Chairman, College Foundations.

To Mr. Ross Carter, Chairman, Instructional Computing Review Committee.

Subject COMPUTER NEEDS - KING EDWARD CAMPUS

Below is a summary of responses received to date, regarding educational computing needs.

COLLEGE FOUNDATIONS DIVISION

- requires stand-alone microcomputers as word processing and electronic accounting machines for Business Education (25 units with printers and software).

- The Science Department requires an 'Apple' or compatible microcomputer for classroom use.

  The Department would like to use existing public domain and PEMC Apple software.

- The Humanities Department requires computer access (micro or Prime) for its writing program.

- Basic Education would like two microcomputers for drill and practise.

- Geography, Economics, etc. have identified the need to include graphics analysis, etc., into their curriculum.

TRAINING AND DEVELOPMENT

- Adult Special Education needs microcomputers with printers and voice synthesizers for use with both hearing and visually impaired students.

- Pharmacy Program requires microcomputers for drill and practise in pharmacy math. Additional terminals (Pharmacom) are needed for greater exposure to pharmacy computer use.

- Automotive Program needs terminals or stand-alone micro-computers for parts inventory control. Software known as "Garage Package" is suggested. Accounting and invoice

☐ Central Administration
☒ King Edward Campus
☐ Vancouver Vocational Institute
☐ Langara Campus
☐ Continuing Education

VANCOUVER COMMUNITY COLLEGE VCC

November 15, 1984.

TRAINING AND DEVELOPMENT (Contd.)

- Automotive Program needs terminals or stand-alone microcomputers for parts inventory control. Software known as "Garage Package" is suggested. Accounting and invoice billing software is needed to expose students to computer applications in the automotive repair industry.

- TRAC requires terminals or microcomputers for testing and classroom management.

- B.T.S.D. is exploring integration of drill and practise into its curriculum. A committee has been activated. Resources to support have not been fully explored as yet.

ENGLISH LANGUAGE TRAINING DIVISION

- Night School and NED programs need a microcomputer with word processing and spreadsheet software. The above to be used for educational management.

LEARNING CENTRE

- The Learning Centre will need micros or terminals to provide independent study drill and practise compatible with instruction.

INSTRUCTOR COMPUTER AWARENESS

- This has been identified as the greatest need. Several levels of awareness and utilization capacity probably exist: (a) introductory; (b) awareness and application of courseware; (c) development processes of courseware (e.g. utilization of PLANIT).

RC/PC

APPENDIX D

LANGARA CAMPUS INVENTORY OF

COMPUTING REQUIREMENTS

Preliminary Survey July and October, 1984

VANCOUVER COMMUNITY COLLEGE
INSTRUCTIONAL COMPUTING COMMITTEE

Future Use of Computers at Langara

ARTS & SCIENCES

English and Modern Languages Division

- currently Communications 119 and 219 (1 section of each) are taught totally in the micro-lab at the campus.

- expansion of these two courses to 4 - 5 sections of each/term should occur over the next 5 years.

Social Sciences Division

- Economics courses will likely require an introduction to computer use of spreadsheets, stats, graphs.

- Psych. research courses (4/year) require access to terminals.

- access to a word processor with graphics for writing anthropological reports.

- possible conversion of some courses to CAI therefore require access to microcomputers, e.g. Art History, Geography for both faculty and students.

Math Sciences Division

- Over the next five years increased use of terminals is anticipated for statistics courses (10 sections in Fall & Spring). Exposure to micros in these courses is also an eventuality.

- For the C.S.T. program and Computer Science courses (10 sections in the Fall & Spring), the availability of another micro lab like the present one would be extremely advantageous to allow student work time over and above class time.

- Chemistry and Physics courses would greatly benefit from Graphics packages via terminals (approximately 10 sections/year, including both Physics and Chemistry).

- Biology genetics courses (2 sections total) would benefit from CAI, simulation and graphics programs via terminals.

/... CAREER PROGRAMS

CAREER PROGRAMS

Omega Division

1. Journalism

   - requires everyday use of computers for all Journalism courses - currently has none.

   - requires replacement of all typewriters with terminals (20) with hookup to PRIME in Journalism classes.

   - requires 1 central disc drive computer unit with 4 additional VDT's for news room with line printer.

   - requires new computerized typesetter which would accommodate all of the College's typesetting needs and service other word processing programs.

2. Court Reporter

   - as B.C. has switched to CAT (Computer Assisted Transcription) this program must update to this methodology.

   - a request to the Skills Growth Fund for a CAT system is being prepared.

3. Photography and Library Technician and Art in Merchandizing

   - require 2 terminals for such things as quality control, inventory control and CAI, and computer graphics and access to a central data base.

4. Criminal Justice, Welfare Aide, Food Services

   - require an introduction to use of computers as these are used in the workplace.

Alpha Division

1. P.E. & Recreation

   - require training on use of computers and inventory control and program planning via word processing.

   - 2 terminals for faculty use and demonstration.

/... 2. Business Administration

CAREER PROGRAMS

Alpha Division

2. Business Administration

Accounting

- require terminal for 35 - 40 students as most accounting practices are becoming computerized.

- require terminals for faculty (6) to develop lessons and CAI in Accounting.

Small Business, Marketing and Sales, Finance and Investments and Business Management

- require faculty terminals to develop CAI for these programs.

- students require some terminal and microcomputer time to learn applications.

Realty Appraisal

- has 1 terminal with Vandat services; requires at least 5 terminals.

3. Computer Information Systems Cooperative Education Program

- instructors require 3 - 4 microcomputers to develop teaching aids for student learning and CAI.

- also require a terminal for each instructor to transpose learning materials to the prime.

4. Nursing

- requires at least 10 terminals for CAI and testing practise for students.

- requires at least 4 terminals for faculty use to develop materials, as soon as possible.

- requires at least 3 microcomputers to allow use of BCHA (B.C. Hospitals' Association) patient care planning software (Ontario is using and paying for development).

- submitting a Skills Growth Fund application to develop and run a CAI Nursing Program for part-time students. September proposal: 60 to 240 hours of development per 1 hour of simulation.

L. Fennema

/PC
November 15, 1984.

APPENDIX E

COMPUTING EQUIPMENT

June 1984 Snapshot Inventory

APPENDIX E

Following is an inventory of instruction users of the College's minicomputer and the numbers of registrants during the 1984 Spring term:

Prime Computer - Instructional Users

Langara

		Sections	Registrants
Data Processing	DP 118	1	30
	DP 218	1	22
	DP 328	1	26
	DP 428	1	23
	C&T 215	1	23
	Sys 321	1	16
	CSc 231	1	30
Computer Science	CSc 135	6	161
	CSc 235	3	84
	CSc 436	1	26
Statistics	Stats 123	2	67
	Stats 124	3	110
	Stats 181	1	29
	Stats 224	2	39
Intro to DP	DP 115	3	121
	DP 215	2	70
			877

NB! The above is a tally of heavy users of the computer. An increasing number of classes use the computer for short periods/projects e.g. photography, mathematics 310, accounting, and journalism (pending). The Realty Appraisal Program terminal is linked to Vandat Realty data base and the Pharmacy Assistant Program terminal is linked to Uni-Drug for dispensing information, in addition.

VVI

Junior Computer Programmers	COBOL	3	18-20
	BASIC	2	18-20

CE/VVI

	BASIC	7	18
	PASCAL	1	18

CE/Langara

	BASIC	2	20-22
	PASCAL	1	20-22

Other Computers

VVI Computer Assisted Drafting		1	18

These and the courses noted e.g. photography, math, accounting, etc. are utilizing the following resources:

Prime Computer - Instructional Terminals

Langara

Room:	A152	28	... room for another 12+
	Library	18	
	A210	30	... room for 5 or a printer unsatisfactory
	Stats Lab	6	
	Faculty Room	2	
	Faculty Offices	7	... mostly math and data processing
	Nursing Lab	1	
	Physics Lab	1	

VVI

Room:	819	14	
	830	16	
	Drafting	19	... terminals and computer to support CAD installed
	Power Eng.	1	

KEC

None

Prime Computer - Printers

Langara

A154	Two 300 1 pm printers

VVI

819	Two 120 cps printers
830	One 600 1pm printer

In addition the following microcomputer resources are available and ultilized in a variety of course and programs as noted:

Microcomputers

Langara

			Course/Program
Psychology Lab	1	Apple II	Psychology
Chameleon	1	Commodore	Small Business
Computer Science	23	IBM P.C. (Lab)	Comp. Syst. Technology and Computers in the Workplace.
	2	Apple MacIntosh	
	2	IBM P.C. (Office)	
	1	IBM P.C.	Instructor and Curriculum Dev.
Computer Centre	1	IBM P.C.	Data Processing
	1	IBM P.C.	Development

KEC

Computer Lab	16	Commodore 64	College Foundations and C.E.
	4	PET	College Foundations and C.E.
	1	Apple II+	School Canadiana
	1	Apple II+	ELT
Adult Special Ed.	1	Apple II e	Adult Special Ed.
Counselling	1	Apple II e	Assessments

CE/KEC Library	9	Health 89	Introduction to Computers and Applications
	1	Health Z100	

VVI

	3	IBM Microcomputers	Business Education
	2	Apple II	Power Engineering
Electronics	11	Morrow Design	Computer Electronics
	8	Apple Clones	
	-	Processors/Parts	
CE/VVI	10	Control Data	Career Start

IMS

For loan (KEC)	1	Heath 89	Curriculum and Instructor Dev.
	2	Pet	Curriculum and Instructor Dev.
CE/QUANTUM RES.	10	IBM PC	Applications Instruction

APPENDIX F

INSTRUCTIONAL COMPUTING SURVEY

INSTRUMENT

November, 1984

MEMO

Date November 2, 1984.

From Ross Carter, Chairman, Inst. Computing Review Committee.

To All Instructional Personnel.

Subject **INSTRUCTIONAL COMPUTING SURVEY**

The use of computers in the City, and at Vancouver Community College, has increased dramatically in recent years. A college-wide committee is examining the implications of this trend for future directions within V.C.C. A key focus in assessing Vancouver Community College's need, and capacity, to respond will be instructors' perceptions, amount of computer skills, and training aspirations. Your views and input to the review that is occurring are, therefore, required and important.

Please take the time to complete the attached survey. Your responses will be confidential, and used to assess the College's current position in each of several major economic sectors (e.g. Health, Business, etc.).

JGC/PC
Attd.

- ☐ Central Administration
- ☐ King Edward Campus
- ☐ Vancouver Vocational Institute
- ☐ Langara Campus
- ☐ Continuing Education

VANCOUVER COMMUNITY COLLEGE VCC

1. Have you already received a copy of this survey in another VCC department?

___ No (GO TO QUESTION 2)
___ Yes (DO NOT PROCEED ... PLEASE RETURN THIS COPY TO YOUR CAMPUS ADMINISTRATOR)

13-16 2. In what VCC department are you now primarily employed?

_____ ☐☐☐☐
(department name)

17 3. Are you now employed in any other VCC department?

18-21 1___ No
2___ Yes (please specify) _____ ☐☐☐☐
(department name)

22 4. What is your current employment status at VCC? (please check one)

1___ Regular Instructor
2___ Term (Contract) Instructor
3___ Auxiliary (Time Sheet) Instructor
4___ Instructional support staff
5___ Program coordinator
6___ Assistant department head
7___ Department head or chairman
8___ Division chairman

23 5. Are you scheduled to teach any class(es) at V.C.C. this month?

24-25 1___ No (GO TO QUESTION 13)
2___ Yes
→ How many hours are you scheduled to teach this week at VCC? _____ ☐☐

Integration of Computers in the Classroom

26 6. Which of the following best describes the current use of computers in your course(s)? (please check one)

1___ State-of-the-art computing used
2___ Current, but not state-of-the-art computing used
3___ Computer use is becoming out of date
4___ Out of date, but still functional
5___ Out of date, and no longer functional
6___ No use of computers, but there needs to be
7___ No use of computers, nor does there need to be

27 7. Would instruction in your course(s) be improved if it included more computing? (please check one)

1___ Don't know
2___ No
3___ Yes, as soon as possible
4___ Yes, eventually

28-41 8. Which of the following computer applications are graduates of your program/course(s) now using in the workplace? (please check all that apply):

1___ Don't know (GO TO QUESTION 9)
2___ Research and development
3___ Management information
4___ Design
5___ Comunications
6___ Data management
7___ Financial operations
8___ Inventory operations
9___ Production and mechanized operations
10___ Word processing
11___ Marketing
12___ Testing and analysis
13___ Other (please specify) _____
14___ No use of computers in the workplace

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42-45 9. To what extent are each of the following part of the course(s) you are currently teaching at V.C.C.? (please check)

Topics	Fully Covered (4)	Covered To some Extent (A)	Not At All Covered (8)
Introduction to computers and computing	____	____	____
Computer applications	____	____	____
Computer assisted learning	____	____	____
Uses of computers in accessing learning resources	____	____	____

46-49 10. In your opinion, to what extent should each of the following now be part of the course(s) you currently teach: (please check)

Topics	Should be Fully Covered (4)	Should be Covered to Some Extent (A)	Should Not be Covered At All (8)
Introduction to computers and computing	____	____	____
Computer applications	____	____	____
Computer assisted learning	____	____	____
Uses of computers in accessing learning resources	____	____	____

50-60 11. Which of the following do you now expect students in your course(s) to learn? (please check all that apply):

- ____ In general, how computers operate
- ____ Operate a keyboard effectively
- ____ Plan for instructional computing
- ____ Evaluate software
- ____ Develop instructional software
- ____ Program
- ____ Utilize a specific program
- ____ Instruct a specific computer application
- ____ Instruct programming
- ____ Other (please specify) _____
- ____ None of the above

61 12. To what extent will computers have an impact in the next five years on students graduating in your area of instruction? (please check one):

- ____ Significant impact
- ____ Some impact
- ____ No impact
- ____ Don't know

Resource Availability

62-69 13. Which of the following computer resources do you now have access to? (please check all that apply)

- ____ Computer account on the College computer
- ____ Micro-computer(s) in your department
- ____ Micro-computer(s) shared by your department
- ____ Computer at home
- ____ Computer(s) at a business or industry site
- ____ Computer(s) at a university, other college, or instructional establishment
- ____ No access at present
- ____ Other (please specify): _____

70-73 14. What access do the students in your class(es) now have to computer resources? (please check all that apply):

- ____ Computer account on the College computer
- ____ Micro-computer(s) in your department
- ____ Micro-computer(s) shared by your department
- ____ No access provided (GO TO QUESTION 16)

74-82 15. How was the software your students now use in your class(es) obtained? (please check all that apply):

- ____ Your department purchased it through a commercial supplier
- ____ You wrote the computer program(s)
- ____ Acquired through the V.C.C. Library
- ____ Acquired through the Provincial Education Media Centre
- ____ Acquired through V.C.C. Computer Services department
- ____ Acquired through another instructional department at V.C.C.
- ____ Copied from an available computer program
- ____ Other (please specify) _____
- ____ Don't know

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Resource Development

83-93 16. What will you need to understand about computing in the next five years? (please check all that apply):

,____ In general, how computers operate
,____ How to operate a keyboard effectively
,____ How to plan for instructional computing
,____ How to evaluate software
,____ How to develop instructional software
,____ How to program
,____ How to utilize a specific program
,____ How to instruct a specific computer application
,____ How to instruct programming
,____ Other (please specify) _____
,____ None of the above

94-99 17. To what extent are each of the following now limiting the amount of computer-related instruction in your class(es)? (please check)

Impediments to Further Computer-Training in Your Class	Definitely Impeding (1)	Impeding To Some Extent (2)	Not At All Impeding (3)	Don't Know (4)
Your current understanding of computing	____	____	____	____
Appropriateness of computers in your course(s)	____	____	____	____
Availability of printers linked to the College computers	____	____	____	____
Availability of micro-computers	____	____	____	____
Availability of software appropriate for your course(s)	____	____	____	____
Availability of specialized equipment supporting a computer application	____	____	____	____

100-112 18. In which types of the following computer languages and softwares have you received formal or informal training? (please check all that apply)

,_____ Have received no formal computer language training (GO TO QUESTION 19)
,_____ Low level programming language (e.g., Assembler)
,_____ High level programming language (e.g., FORTRAN)
,_____ Operating system (e.g. MSDOS, UNIX)
,_____ Statistical analysis package (e.g. SPSS)
,_____ Computer assisted instruction package (e.g., PLATO)
,_____ Course authoring package (e.g., CRS Trainer)
,_____ Word processing (e.g., WordStar)
,_____ Spread sheet (e.g., VisiCalc)
,_____ Database manager (e.g., DBase, POWER)
,_____ Graphics package (e.g., VisiPlot)
,_____ Electronic mail (e.g., ENVOY)
,_____ Communication package (e.g., Smartcom)
,_____ Other (please specify) _____

113-125 19. How frequently do you now use the following types of software?

	(Please check) Frequently (1)	Often (2)	Rarely (3)	Never (4)
Low level programming language	____	____	____	____
High level programming language	____	____	____	____
Operating system	____	____	____	____
Statistical analysis package	____	____	____	____
Computer assisted instruction package	____	____	____	____
Course authoring package	____	____	____	____
Word processing	____	____	____	____
Spread sheet	____	____	____	____
Database manager	____	____	____	____
Graphics package	____	____	____	____
Electronic mail	____	____	____	____
Communication package	____	____	____	____
Other	____	____	____	____

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20. Please list the computer languages and/or softwares, if any, in which you are planning to upgrade your skills.

21. Which of the following have you used to acquire an understanding of computers? (please check all that apply)
126-139

/_____ Your professional development time
/_____ Your professional development time, supplemented by other P.D. time pooled by your department
/_____ Work experience at the College
/_____ Courses taken at V.C.C.
/_____ Workshops, conferences and seminars
/_____ Industry observation
/_____ Education and industry exchange
/_____ Part-time employment, outside V.C.C.
/_____ Affiliation with professional or trade organization
/_____ Reading technical literature
/_____ Courses taken outside V.C.C.
/_____ Observation of student on-the-job training
/_____ Outside consulting work
/_____ Hobby & general interest activities

Future Directions:

22. How important for your area will each of the following be in the next five years?
140-144

	(Please check)			
	Very Important (1)	Important To Some Extent (2)	Not At All Important (3)	Don't Know (4)
Adaptations of existing curricula to include more computing	____	____	____	____
Acquisition of types of computing not now owned by V.C.C.	____	____	____	____
More access to types of computing now owned by V.C.C.	____	____	____	____
Upgrading of your understanding of computing	____	____	____	____
Acquisition of computer assisted instruction software	____	____	____	____

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145-158 23. How important will each of the following be to you in the next five years in obtaining a further understanding of computing?

	(Please check) Very Important (1)	Important To Some Extent (2)	Not At All Important (3)
Your professional development time	____	____	____
Your professional development time, supplemented by other P.D. time pooled by your department	____	____	____
Work experience at the College	____	____	____
Course(s) taken at Y.C.C.	____	____	____
Workshops, conferences and seminars	____	____	____
Industry observation	____	____	____
Education and industry exchange	____	____	____
Part-time employment, outside Y.C.C.	____	____	____
Affiliation with professional or trade organization	____	____	____
Reading technical literature	____	____	____
Courses taken outside Y.C.C.	____	____	____
Observation of student on-the-job training	____	____	____
Outside consulting work	____	____	____
Hobbies and general interest activities	____	____	____

159 24. Are there existing computer-related topics in your area for which new courses should be developed at Y.C.C.? (please check one):

1 _____ Don't know
2 _____ No
3 _____ Yes (please describe) _____

160 25. Are there new and emerging computer-related topics in your area for which Y.C.C. should develop new courses? (please check one):

1 _____ Don't know
2 _____ No
3 _____ Yes (please describe) _____

26. Comments, or suggestions:

*** PLEASE RETURN THIS SURVEY BY NOVEMBER 22, 1984 TO YOUR DEPARTMENT HEAD ***

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APPENDIX G

VVI COMPUTER AWARENESS PROGRAM

Vancouver
Vocational Institute
250 West Pender Street,
Vancouver, B.C. V6B 1S9
Telephone 681-8111

ANNOUNCING A COMPUTER AWARENESS PROGRAM
TO REDUCE YOUR ANXIETY ABOUT THE TECHNOLOGY
AND ITS USE IN YOUR INSTRUCTIONAL AREA

WHAT IT IS ...?

This program has been developed and tested by Karl Gregg of the Program Development Department. It is for all Vancouver Vocational Institute employees.

The main goal of the program is to make all employees more aware of computers and reduce "cyberphobia" - anxiety about computer technology.

To accomplish this goal, the orientation of study material and hands-on experiences is toward common everyday tasks.

You may choose to learn about the main college computer and/or any of the available micro computers.

INSTRUCTORS ARE ENCOURAGED TO USE THEIR PROFESSIONAL DEVELOPMENT LEAVE FOR THIS PURPOSE

PROGRAM GOALS ...

- de-mystify computer jargon and terminology
- explain fundamental computer concepts
- teach the use of any terminal
- use the main computer as a simple text editor
- make use of a computers' word processing powers
- introduce the BASIC programming language
- provide awareness of specific computer applications that support the instructional process.
  - explain and apply advanced concepts

PROGRAM FORMAT...

Delivery of instruction is through individualized, self-study stand-alone modules with scheduled access to a tutor each day. Hands-on activity at micro computers and computer terminals enhances the study and makes it more meaningful.

The self-paced design imposes few time-frame constraints so leisure time and/or professional development time may be used to one's best advantage.

Discussion and counselling will be available to plan the optimum selection of courses and modules, thus accommodating individual requirements.

Individuals will encounter self-tests and exercises in the written materials and may be quizzed from time-to-time through the computer to provide personal progress monitoring.

Assignments will provide the tutor with a feedback tool to assist the learner and improve the program. Assignments may be also used as the basis for seminar sessions.

PROGRAM CONTENT OVERVIEW ...

COURSE	CONTENT
1	Introduction to computer concepts
2	Word processing on the VCC computer
3	Word processing on a micro computer
4	Introduction to programming in BASIC (VCC computer)
5	Introduction to programming in BASIC (micro computer)
6	Instructional support applications
7	Advanced computer applications

Only those courses of interest need be taken. For details, see Karl Gregg or consult the pages following. Call Karl Gregg at Local 242 for more information.

VCC

PROGRAM DEVELOPMENT DEPARTMENT

A N N O U N C I N G

A

COMPUTER AWARENESS PROGRAM

WITH SEVEN COURSES...

1 Introduction to computer concepts

2 Word processing on the VCC computer

3 Word processing on a micro computer

4 Introduction to programming in BASIC (VCC computer)

5 Introduction to programming in BASIC (micro computer)

6 Instructional support applications

7 Advanced computer applications

First registration will accept up to twenty faculty into the program with further intakes each month. (To be announced in VVInsider)

A wait-list will be maintained.

Tutoring will be available, if required, in room 220 between 11:30 and 12:30 each day.

Please call for an appointment if you wish to discuss pre-requisites or you need an explanation of the attached program description.

Your tutor

Karl

Karl Gregg, local 242

DETAILED CONTENT ...

COURSE 1

Introduction to computer concepts

MODULE	DESCRIPTION
1.0	Introduction and course overview
1.1	Terminology, jargon
1.2	Computer concepts
1.3	First contact
1.4	Software overview
1.5	Getting started
1.6	Text input and storage
1.7	Text editing
1.8	Text formatting and printing

COURSE 2

Word Processing on the VCC computer

Prerequisites: All of course 1, (or equivalent)

MODULE	DESCRIPTION
2.0	Introduction, prerequisite review and course overview
2.1	Working with computer files
2.2	Finding and printing lines of text in a file
2.3	Editing lines
2.4	Page formatting
2.5	Text formatting
2.6	Advanced concepts

COURSE 3

Word processing on a micro computer

Prerequisites: Modules 1.0 through 1.4 (or equivalent)

MODULE	DESCRIPTION
3.0	Introduction, prerequisite review and course overview
3.1	Concepts common to micro computers
3.2	Word processing concepts
3.3	Production of a simple document

COURSE 4

Introduction to programming in BASIC (VCC computer)

Prerequisites: Modules 1.0 through 1.6 (or equivalent)
Modules 2.0 and 2.1

MODULE	DESCRIPTION
4.0	Introduction, prerequisite review and course overview
*4.1	Task analysis and program design
4.2	Entering, storing, recalling and running a program
4.3	BASIC programming techniques
4.4	Working with data files

* Module 4.1 has the same content as 5.1

COURSE 5

Introduction to programming in BASIC (micro computer)

Prerequisites: Modules 1.0 through 1.6 (or equivalent)
Module 3.1

MODULE	DESCRIPTION
5.0	Introduction, prerequisite review and course overview
*5.1	Task analysis and program design
5.2	Entering, storing, recalling and running a program
5.3	BASIC programming techniques
5.4	Working with data files

* Module 5.1 has the same content as 4.1

COURSE 6

Instructional support applications

Prerequisites: Modules 1.0 through 1.6 (or equivalent)

MODULE	DESCRIPTION
6.0	Introduction, prerequisite review and course overview
6.1	Exam marking and analysis
6.2	Planning and scheduling
6.3	Computer assisted test construction
6.4	Computer assisted instruction
6.5	Computer managed instruction

COURSE 7

Advanced computer applications

Prerequisites: Course 1; All. Course 2; All. Course 4; All.
(or equivalent)

MODULE	DESCRIPTION
7.0	Introduction, prerequisite review and course overview
7.1	Advanced use of PRIME editor
7.2	Advanced PRIMOS commands
7.3	The SORT sub-system
7.4	Programming language for interactive teaching (PLANIT)
7.5	Advanced word processing (micro)
7.6	Spread sheet (micro)
7.7	Data base management (micro)
7.8	Topics and tutoring individually arranged

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